

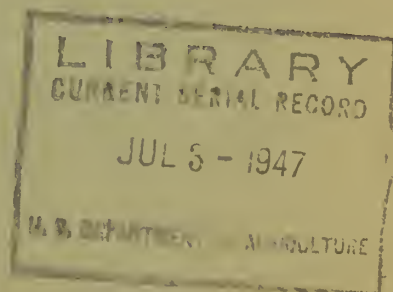
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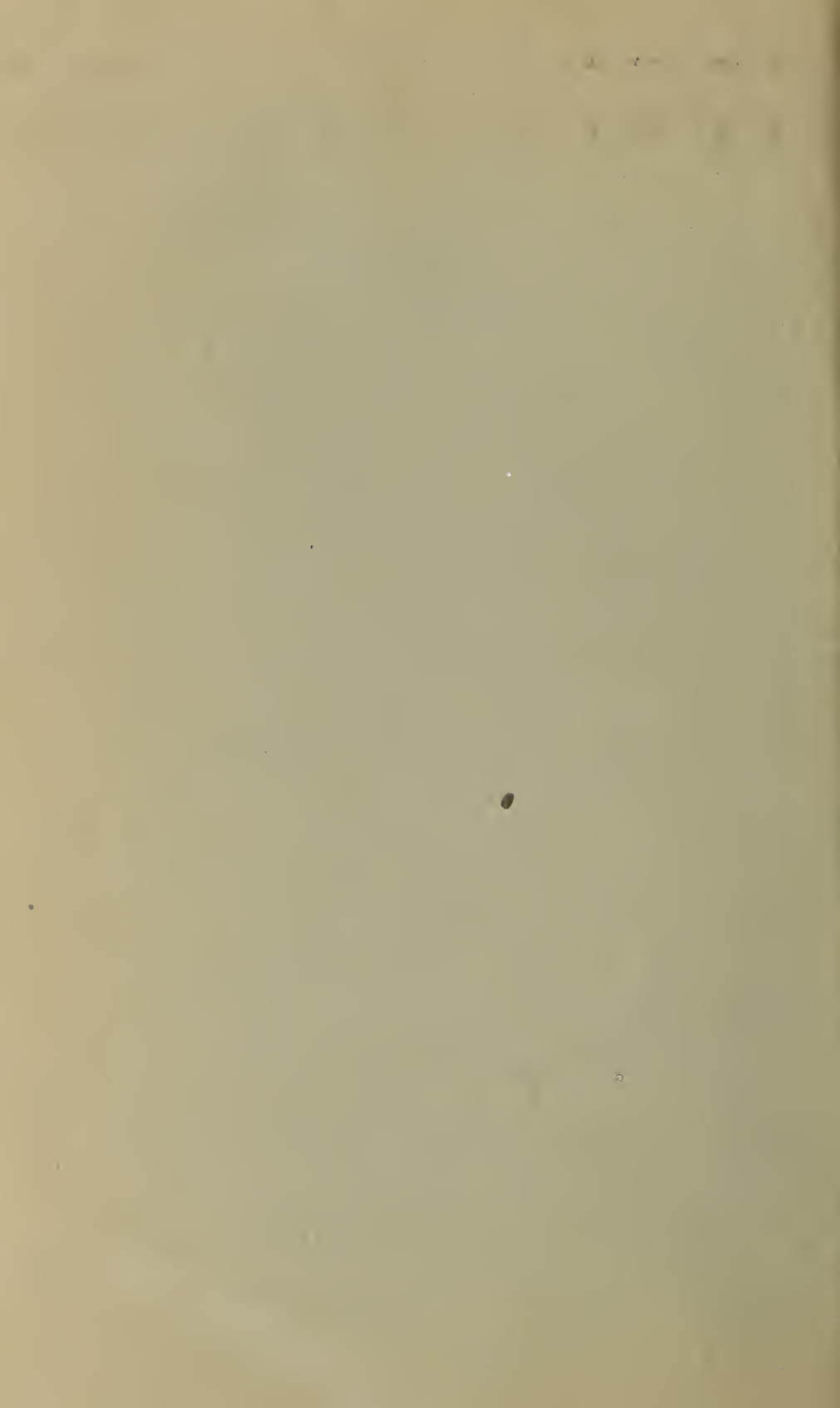
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UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

THE POCKET GOPHERS
(GENUS THOMOMYS) OF ARIZONA

NORTH AMERICAN FAUNA 59





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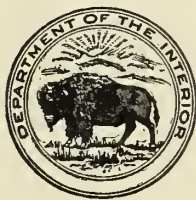
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BY

EDWARD A. GOLDMAN



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THE POCKET GOPHERS (GENUS THOMOMYS) OF ARIZONA

BY EDWARD A. GOLDMAN, formerly *Senior Biologist, Biological Surveys, Division of Wildlife Research, Fish and Wildlife Service*

INTRODUCTION

Pocket gophers of the genus *Thomomys* inhabit practically every part of Arizona, from the desert lowlands near the Delta of the Colorado River to near the tops of the highest mountains, including San Francisco Mountains at timber line, where the altitude is approximately 11,500 feet. Between these extremes in altitude the sedentary pocket gophers occupy every sort of habitat in which it is possible to burrow. In general, soft or sandy soil is preferred, but in some places there is so little soil that the excavated material consists almost entirely of small stones. In the desert regions some soils are so hard and compact that excavation is difficult, and with plants widely spaced the food supply is evidently precarious.

The following review of the pocket gophers of Arizona is primarily a distributional study, based mainly on the collections in the United States National Museum, including the extensive Biological Surveys collection. For the loan of specimens in their charge, however, the writer is indebted to Laurence M. Huey, Natural History Museum, San Diego, Calif.; the late Dr. Joseph Grinnell and Dr. E. Raymond Hall, then of the Museum of Vertebrate Zoology, University of California, Berkeley, Calif.; and to Dr. W. H. Burt, Museum of Zoology, University of Michigan, Ann Arbor, Mich. The maps were drawn by Mrs. Katheryne C. Tabb, of the Fish and Wildlife Service. No effort has been made to include the many published references to pocket gophers in the State, most of which would add little or nothing to present knowledge of distribution as determined by specimens examined. Colors mentioned are mainly from Robert Ridgway, "Color Standards and Color Nomenclature," 1912.

GROUPS OF ARIZONA POCKET GOPHERS

The pocket gophers of Arizona are assignable to four apparently distinct groups, as follows: (1) The *Thomomys bottae* group, (2) the *Thomomys baileyi* group, (3) the *Thomomys talpoides* group, and (4) the *Thomomys umbrinus* group.

THOMOMYS BOTTAE GROUP

The *Thomomys bottae* group (fig. 1) embraces most of the pocket gophers of Arizona. It is a remarkable assemblage of closely related forms, ranging from the coast of California through several southwestern States and east to Texas. The Colorado River and its canyons form an effective barrier limiting the distribution of pocket gophers in western Arizona, but one subspecies, *albatus*, forms a connecting link across the Delta of the Colorado River, where shifting channels transfer local populations from one side to the other. The group is also represented north of the Colorado River, in northwestern Arizona.

The *Thomomys bottae* group presents characters as follows: Size variable from rather large to small; form robust; colors of upper parts varying from nearly white to cinnamon buff and rich ochraceous tawny, more or less mixed with black; post-auricular black spots small; mammae normally 4 pairs (2 pectoral and 2 inguinal). Skull of rather heavy proportions; rostrum broad; nasals only slightly tapered and gradually narrowed posteriorly, the ends usually truncate; zygomata heavy, the maxillary arm expanded to form a prominent external angle near line of contact with jugal; interparietal not extending posteriorly beyond plane of suture between parietals and supraoccipital; ossified external auditory meatus moderately developed; upper incisors broad and heavy, usually decurved in vertical plane at anterior ends of nasals.

Members of the *bottae* group are evidently extraordinarily responsive to environmental and genetic influences combined with the isolation factor, as studies reveal that each principal mountain range or valley tends to support its more or less peculiar form, marked by variations in combination of details of a pattern of general characters which is maintained with surprising uniformity throughout the group. The intergradation of forms is clearly exhibited in some cases, and in others, in which it is not shown by the material at hand, the quantitative characters presented are those known to be of subspecific value elsewhere, and are assumed to warrant the use of a subspecific name. Despite the large number of subspecies that have been described, very few names can be relegated to synonymy. It is evident, however, that there is now an approach to the limit of the number of forms that can be recognized in Arizona.

Isolation is evidently an important factor in the evolution of the many forms. Distribution is irregular. Local colonies, which may consist of numerous individuals, develop in areas where the soil is soft, as along a wash in the bottom of a desert valley, or in

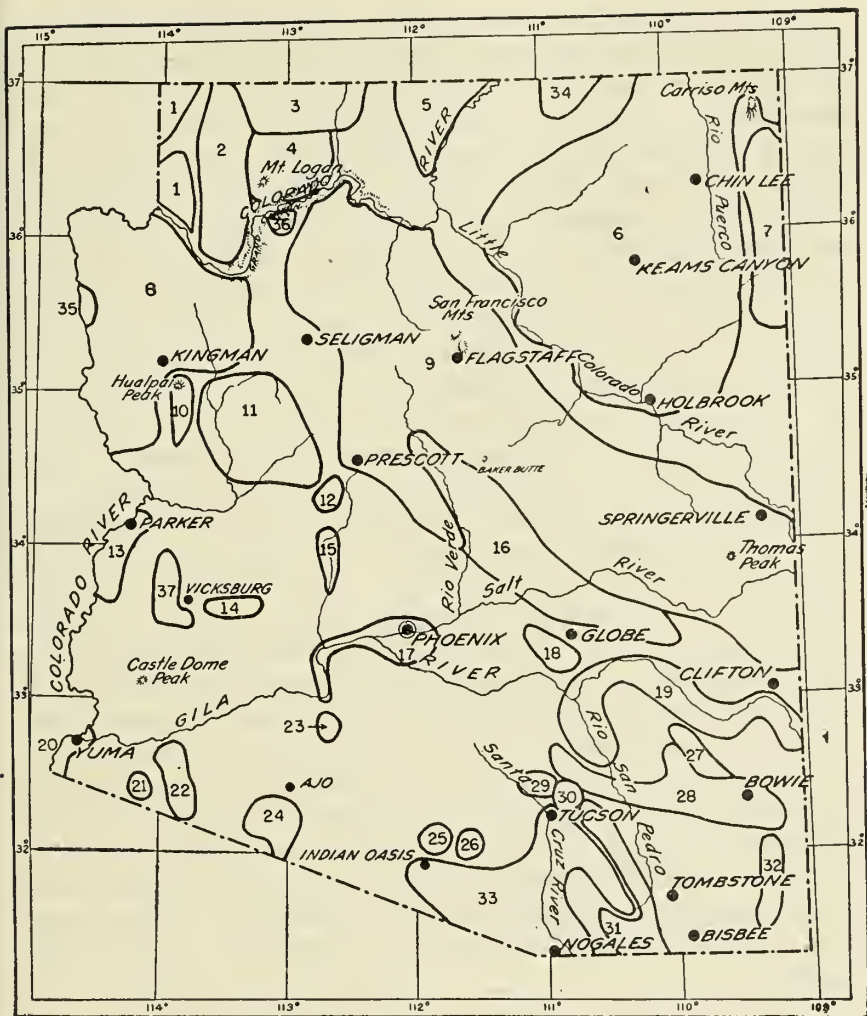


Figure 1.—Distribution of species and subspecies of *Thomomys bottae* group in Arizona:

- | | | |
|--------------------------------|---------------------------------|-------------------------------|
| 1. <i>T. b. virgineus.</i> | 13. <i>T. b. chrysonotus.</i> | 26. <i>T. b. pusillus.</i> |
| 2. <i>T. b. nicholi.</i> | 14. <i>T. b. sub similis.</i> | 27. <i>T. b. grahamensis.</i> |
| 3. <i>T. b. planirostris.</i> | 15. <i>T. b. patulus.</i> | 28. <i>T. b. extenuatus.</i> |
| 4. <i>T. b. trumbullensis.</i> | 16. <i>T. b. mutabilis.</i> | 29. <i>T. b. catalinae.</i> |
| 5. <i>T. b. absonus.</i> | 17. <i>T. b. cervinus.</i> | 30. <i>T. b. parvulus.</i> |
| 6. <i>T. b. aureus.</i> | 18. <i>T. b. pinalensis.</i> | 31. <i>T. b. hueyi.</i> |
| 7. <i>T. b. peramplus.</i> | 19. <i>T. b. alienus.</i> | 32. <i>T. b. collinus.</i> |
| 8. <i>T. b. desertorum.</i> | 20. <i>T. b. albatrus.</i> | 33. <i>T. b. modicus.</i> |
| 9. <i>T. b. fulvus.</i> | 21. <i>T. b. depauperatus.</i> | 34. <i>T. alexandrae.</i> |
| 10. <i>T. b. hualpaiensis</i> | 22. <i>T. b. phasma.</i> | 35. <i>T. suboles.</i> |
| 11. <i>T. b. desitus.</i> | 23. <i>T. b. aridicola.</i> | 36. <i>T. muralis.</i> |
| 12. <i>T. b. operosus.</i> | 24. <i>T. b. growlerensis.</i> | 37. <i>T. harquahala.</i> |
| | 25. <i>T. b. comobabiensis.</i> | |

a mountain meadow. In such places the burrows may be close together, with many mounds of excavated earth dotting the surface and tunnels interspersed. Numerous mounds may mark the operations of one or several individuals, but studies indicate that each burrow occupant, male or female, is solitary, except during the mating season and during the time that the young must remain in the same tunnels with their mother. Colonies may be more or less isolated by areas of nearly impervious soil or by rock formations, with breeding connections between them uncertain. Below the upper walls of the Grand Canyon one form, *muralis*, was found living in isolated strips of soil only a few feet wide, bounded above and below by vertical cliffs about 300 feet high. It presents rather well marked characters, and in this and a few similar cases the use of full specific names seems warranted, although the close relationship to a neighboring form is also clearly evident.

Response to environmental conditions is shown by the marked tendency of pocket gophers to assume the colors of the soils in which they burrow. This tendency is shared with many other mammals, but is especially noteworthy in the forms of the *Thomomys bottae* group. Pocket gophers of this group inhabiting light-colored sand are usually light shades of buff, varying to almost white; those living in reddish soils assume rufescent tones; and those from blackish terrain, especially dark volcanic soils, are usually deeper reddish or dark brown, and may vary to black in some specimens. Occasional melanistic individuals may occur anywhere, but black or blackish specimens are more prevalent in lava areas. Pocket gophers inhabiting soft, sandy ground or alluvial bottomlands, where food is more abundant, or more accessible, tend to be larger than those inhabiting more rocky or sterile areas.

THOMOMYS BAILEYI GROUP

The *Thomomys baileyi* group (fig. 2), as recognized, embraces several races ranging in western Texas, parts of southern New Mexico (except the Rio Grande Valley), northern Chihuahua, and west to southeastern Arizona, where the group is represented by *T. b. mearnsi*. In some of the more important characters these races agree with those of the *bottae* group, but the zygomata are slender with slight expansion of the maxillary arm near the line of contact with the jugal, the rostrum is of shallow depth, and the upper incisors are strongly procumbent. Representatives of the two groups taken in the same vicinity appear to be distinct.

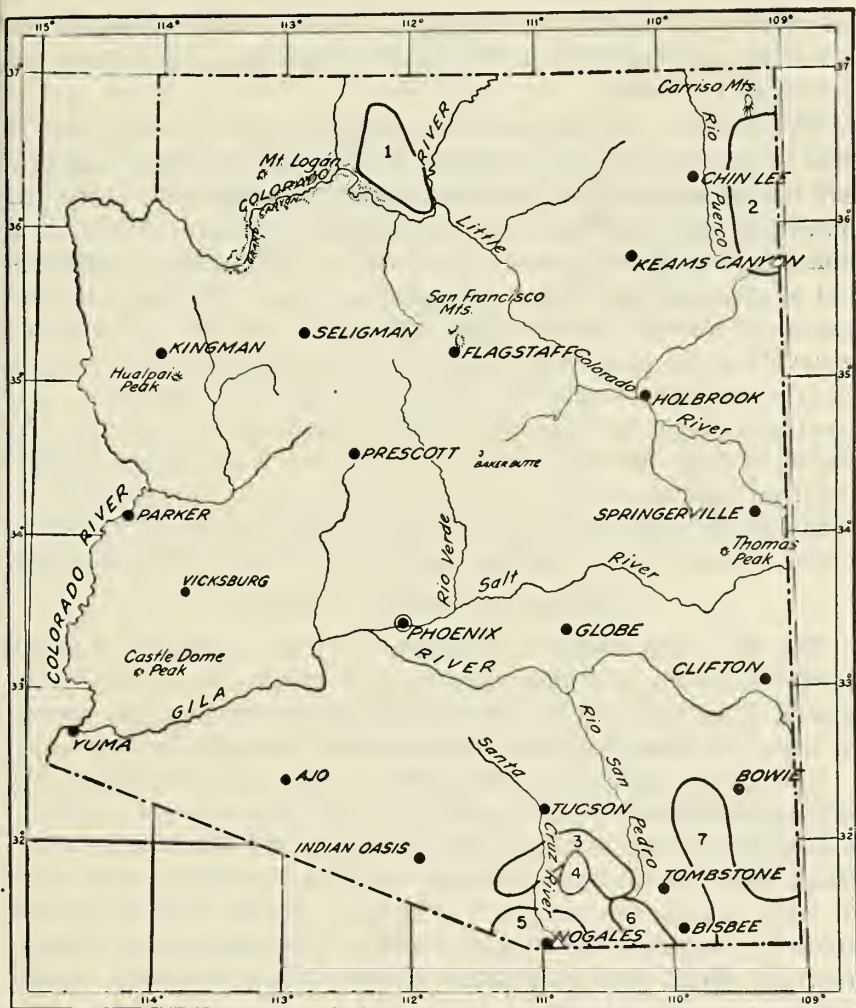


Figure 2.—Distribution of subspecies of *Thomomys talpoides*, *T. umbrinus*, and *T. baileyi* groups in Arizona:

- | | | |
|-------------------------------|-----------------------------|-------------------------------|
| 1. <i>T. t. kaibabensis</i> . | 3. <i>T. u. proximus</i> . | 6. <i>T. u. intermedius</i> . |
| 2. <i>T. t. fossor</i> . | 4. <i>T. u. burti</i> . | 7. <i>T. b. mearnsi</i> . |
| | 5. <i>T. u. quercinus</i> . | |

THOMOMYS TALPOIDES GROUP

The *Thomomys talpoides* group (fig. 2) is now known to constitute an assemblage of numerous forms which ranges as a whole from Saskatchewan, Alberta, and southern British Columbia southward in the Rocky Mountain region, and meets the distribution area of the *bottae* group in Nevada, southern Utah, northern Arizona, and northwestern New Mexico. In Arizona the group favors the higher mountains and is represented by *T. t. kaibaben-*

sis of the Kaibab Plateau and by *T. t. fossor* which occurs in the Tunitcha and Lukachukai Mountains in the extreme northeastern corner of the State.

The members of the *Thomomys talpoides* group are similar in size to those of the *bottae* group, but the upper parts in general are dull cinnamon buff, the back usually overlaid with rusty, the black post-auricular spots are larger and the general coloration is duller in tone. The mammae vary from four to six pairs (2 abdominal pairs normally present in typical *talpoides*). The skull is elongated and slender; rostrum long and narrow, the sides more deeply excavated than in other groups, leaving the roots of upper incisors clearly outlined; nasals rather broad anteriorly, gradually narrowing posteriorly; zygomata slender, depressed posteriorly, the jugals sloping upward to points of contact with maxillae; ossified external auditory meatus large and prominent; interparietal extends posteriorly beyond plane of posterior border of parietals; upper incisors narrow and thin, decurved about as in *bottae* group.

THOMOMYS UMBRINUS GROUP

The *Thomomys umbrinus* group (fig. 2), composed of small pocket gophers, is widely dispersed in Mexico. Like the *bottae* group, it is subdivided into numerous geographic races, several of which are restricted to the mountains of southeastern Arizona.

In color of upper parts the members of the *umbrinus* group are between cinnamon brown and russet, varying to sayal brown in *proximus*, the back usually deep black along the median line; black post-auricular spots usually large and confluent with black of back in some specimens. The skull is slender, with brain case smoothly rounded, the temporal ridges inconspicuous or absent; rostrum short, and moderately broad; nasals distinctly wedge-shaped, narrowing posteriorly, the ends usually emarginate; zygomata slender, the sides nearly parallel; ossified auditory meatus small; upper incisors relatively broad and heavy, decurved in vertical plane at anterior ends of nasals in Arizona forms, strongly procumbent in numerous Mexican races.

ECONOMIC STATUS

The pocket gophers of all groups consume plant food, but their widespread burrowing activities, which tend to stir the soil, are, under natural conditions, beneficial to plant growth and thus indirectly to other animals dependent on plants. Erosion of the land surface may, however, be started by water entering the tunnels, especially where these extend up and down steep slopes. Beneficial habits are, therefore, offset by some destructive ef-

fects, and pocket gophers seem rather negligible in the biotic complex. The desert forms are limited in numbers by the food supply and by natural enemies. Where desert land is brought under irrigation and cultivation, however, the food supply is greatly increased, predation is lessened, and the pocket gopher population may be expected to rise inordinately unless effective control measures are adopted. On cultivated lands severe damages result from crops directly consumed, or roots severed, and from the tunnels which often cause breaks in irrigation ditches.

SPECIES AND SUBSPECIES OF THOMOMYS BOTTAE GROUP

THOMOMYS BOTTAE VIRGINEUS GOLDMAN

VIRGIN VALLEY POCKET GOPHER

Thomomys bottae virgineus Goldman, Biol. Soc. Wash. Proc. 50: 133, September 10, 1937.

Type.—From Beaverdam Creek, near confluence with Virgin River, at Littlefield, northwestern Arizona (altitude 1,500 feet); collected by Luther C. Goldman, October 16, 1936.

General characters.—A cinnamon-buff form, similar to *centralis* of eastern Nevada, but skull relatively narrower, more elongated, the zygomata less widely spreading, more distinctly bowed inward near middle of jugals. Similar to *nicholi* of the Shivwits Plateau region, but somewhat darker, and skull differing in about the same characters as from *centralis*.

Measurements.—Average of three adult male topotypes: Total length, 232 (232-232); tail, 74 (72-75); hind foot, 31.5 (31-31.5) millimeters. Two adult female topotypes, respectively, 207, 210; 62, 58; 28, 29.5 millimeters.

Distribution and habitat.—The range of *virgineus* includes the Virgin River Valley below the canyon traversed by the river in breaking across the fault line marked by the Beaverdam Mountains on one side, and the Grand Wash Cliffs on the other, just above the type locality. East of the Virgin Valley this form is found in an extremely arid section near Pakoon Spring, along Grand Wash. The general area inhabited is well down in the Lower Sonoran Zone. On the bottomlands along Beaverdam Creek and the Virgin River, pocket gophers are numerous enough in some places to be destructive to alfalfa, which is grown on a limited scale.

THOMOMYS BOTTAE NICHOLI GOLDMAN

SHIVWITS PLATEAU POCKET GOPHER

Thomomys bottae nicholi Goldman, Jour. Wash. Acad. Sci. 28 (7): 337, July 15, 1938.

Type.—From 20 miles south of Wolf Hole (road to Parashonts), Shivwits Plateau, Mohave County, Ariz. (altitude 5,000 feet); collected by Luther C. Goldman, August 6, 1937.

General characters.—A light, cinnamon-buff subspecies of medium size. Closely allied to *trumbullensis* of the neighboring Mount Trumbull lava area, but paler buff, the back less mixed with black. Similar to *virgineus* of the Virgin River Valley below the break through the Beaverdam Mountains, but somewhat darker; skull differing in detail, the frontals broader, zygomata more widely spreading, and the jugals not distinctly bowed inward as in *virgineus*.

Measurements.—Two adult male topotypes, respectively: Total length, 229, 208; tail, 65, 59; hind foot, 27.5, 28 millimeters. Two adult females from Saint George, Utah, respectively: 208, 204; 71, 63; 27, 27.5 millimeters.

Distribution and habitat.—The range of this pocket gopher is the Shivwits Plateau region, on the terrace between the Hurricane Ledge on the east, and the Grand Wash Cliffs on the west, north of the Grand Canyon, northwestern Arizona. The general area, at 4,500 to 5,000 feet, is in the lower part of the Upper Sonoran Zone, but slopes down at the north end to 2,500 feet altitude in the Lower Sonoran Zone at Saint George, in the Virgin River Valley, just across the Utah boundary. The pocket gophers occur irregularly in small, widely scattered colonies, on land commonly overgrown with *Atriplex* and sagebrush (*Artemisia tridentata*).

THOMOMYS BOTTAE PLANIROSTRIS BURT

ZION PARK POCKET GOPHER

Thomomys perpallidus planirostris Burt, Biol. Soc. Wash. Proc. 44: 38, May 8, 1931.

Type.—From Zion National Park, Utah (altitude 4,400 feet); collected by A. Brazier Howell, May 4, 1920.

General characters.—Size medium but form robust; colors rich, the upper parts distinctly tawny, little modified by dark-tipped hairs. Allied to *absonus* of House Rock Valley, but colors brighter, more tawny, and proportions heavier; skull more massive, with heavier dentition.

Measurements (from Burt).—Average of eight adult male topotypes: Total length, 238.3 (222-261); tail, 75.6 (66-83); hind foot, 32.4 (31-34) millimeters. Average of eight adult female topotypes: 215 (205-228); 71 (61-78); 30.9 (30-33) millimeters.

Distribution and habitat.—The Zion Park pocket gopher is found at 4,500 feet on the broad Upper Sonoran, *Atriplex* overgrown, ter-

race near Fredonia and the vicinity of Kanab Wash to westward. This brightly colored subspecies apparently ranges into Arizona through the Short Creek Valley along the western and southern base of the Vermilion Cliffs west of Fredonia. The burrows in sandy soil were noted at intervals for miles west of Fredonia. While *planirostris* and *absonus* occur at points not far apart, and might be expected to meet along Johnson Creek east of Fredonia, these animals are very local in distribution and may not be in direct contact. Both forms occur in Zion National Park, but their ranges in the park appear to be completely separated. The floor of the narrow valley, at 4,400 feet altitude, in the park, is the type locality of *planirostris*, while *absonus* is found at 5,500 to 5,700 feet in the heads of small canyons and on the plateau near the east entrance above the barrier formed by the escarpment or eastern wall of the valley. At Fredonia pocket gophers enter alfalfa fields, but are not sufficiently numerous to be very destructive.

THOMOMYS BOTTAE TRUMBULLENSIS HALL AND DAVIS

MOUNT TRUMBULL POCKET GOPHER

Thomomys bottae trumbullensis Hall and Davis, Biol. Soc. Wash. Proc. 47: 51, February 9, 1934.

Type.—From 3 miles south of Nixon Spring, Mount Trumbull, Mohave County, Ariz. (altitude 6,500 feet); collected by Seth B. Benson, May 26, 1933.

General characters.—A dark-colored lava-area-inhabiting subspecies. Upper parts normally between cinnamon and cinnamon-buff, usually rather heavily mixed with black. Of 38 specimens examined, 7 are deep glossy black, except the feet and the tip of the tail, which are white. Similar to *nicholi* of the closely adjoining, but lower, Shivwits Plateau, and to *absonus* of House Rock Valley, but color darker than either, the upper parts more heavily mixed with black. Compared with *planirostris*, typical in Zion National Park, Utah, but which also occurs at Fredonia, Ariz., *trumbullensis* is smaller and darker, the upper parts more extensively mixed with black, less tawny; skull slenderer, with lighter dentition.

Measurements.—Average of three adult male topotypes: Total length, 234 (228-238); tail, 76 (71-83); hind foot, 30.5 (30-31) millimeters. Two adult female topotypes, respectively: 210, 204; 68, 56; 28, 26.5 millimeters.

Distribution and habitat.—The range of this subspecies is the lava and cinder area centered about Mount Trumbull on the plateau near the north rim of the Grand Canyon. The area lies mainly along the boundary between the Upper Sonoran and Tran-

sition Zones at 6,000 to 6,500 feet, but extends up to 7,000 feet on the slopes of Mount Trumbull and Mount Logan, and burrows were observed at about 4,500 feet altitude on the prominent cinder cone at the lower end of Toroweap Valley. As pointed out by Hall and Davis (op. cit.: 52), the darker color of this subspecies, compared with the neighboring geographic races, may indicate a response to environmental conditions.

THOMOMYS BOTTAE ABSONUS GOLDMAN

HOUSE ROCK VALLEY POCKET GOPHER

Thomomys perpallidus absonus Goldman, Jour. Wash. Acad. Sci. 21 (17): 425, October 19, 1931.

Type.—From Jacobs Pools, House Rock Valley, Coconino County, northern Arizona (altitude 4,000 feet); collected by E. A. Goldman, June 7, 1931.

General characters.—A dull grayish buffy subspecies of medium size with a narrow, slender skull. Closely allied to *planirostris* of Zion National Park, Utah, and the vicinity of Fredonia, Ariz., but somewhat slenderer, less tawny, and skull less massive.

Measurements.—Average of three adult male topotypes: Total length, 231 (228-234); tail, 77 (74-82); hind foot, 31 (30-32.5) millimeters. Two adult female topotypes, respectively: 210, 217; 69, 70; 30, 29 millimeters.

Distribution and habitat.—The range of *absonus* in Arizona is probably restricted to House Rock Valley, but extends north in Utah to the eastern entrance of Zion National Park, at 5,700 feet altitude.

House Rock Valley occupies a broad depression with a generally level bottom lying in the Upper Sonoran Zone along the northern side of the Marble Canyon of the Colorado River. This reach of the river bisects the interior basin of which House Rock Valley is the northern half, above the upper entrance to the Grand Canyon, and forms a barrier limiting the distribution of this subspecies and of most of the other mammals of the region. The bottom of House Rock Valley is gashed by side canyons of the Colorado, and the dispersal of this pocket gopher is much restricted even here. It has been found inhabiting soft sand extending for several miles out over the floor of the valley from Jacobs Pools, a spring at the western base of the escarpment marking the great fault line known as the Vermilion Cliffs. Burrows are common along the highway through low-growing shrubby vegetation, largely *Atriplex* bushes and *Coleogyne ramossissima*, a dominant species on poor soils. But the pocket gophers feed to

a considerable extent on the roots and tender growing tops of the large white poppy (*Argemone*).

THOMOMYS BOTTAE AUREUS ALLEN

PAINTED DESERT POCKET GOPHER

Thomomys aureus Allen, Amer. Mus. Nat. Hist. Bull. 5: 49, April 28, 1893.

Thomomys latirostris Merriam, Proc. Biol. Soc. Wash. 14: 107, July 19, 1901.

Type from Tanner Crossing, about 3 miles above Cameron, Little Colorado River, Coconino County, Ariz.

Type.—From Bluff, San Juan County, Utah; collected by Charles P. Rowley, May 12, 1892.

General characters.—A large, cinnamon-buff or golden-colored subspecies. Closely allied to and probably intergrading with *peramplus* of the higher mountains of the northeast corner of Arizona.

Measurements.—Average of four adult male topotypes: Total length, 241 (232-252); tail, 73 (69-80); hind foot, 31 (30-32) millimeters. Average of four adult female topotypes: 222 (215-229); 66 (64-72); 30 (30-31) millimeters.

Distribution and habitat.—The range of *aureus* extends from the San Juan Valley, Utah, into northeastern Arizona, along the valley of Chin Lee Creek, and embraces as a whole the major part of the Painted Desert region to the Little Colorado River. Over this area, however, the pocket gophers are very irregularly distributed in more or less isolated colonies that favor the more fertile ground, usually in the valleys, in the Upper Sonoran Zone. Specimens have been obtained at localities varying in altitude from about 4,000 feet along the Little Colorado River to 6,500 feet in the Pueblo Colorado Valley at Ganado. The dominant vegetation of the region occupied consists largely of *Atriplex* bushes or sagebrush (*Artemisia tridentata*), with a scattered growth of nut pines and junipers along the valley borders. *Thomomys latirostris* was based on a single specimen from Tanner Crossing, near Cameron, on the Little Colorado River. Efforts to obtain topotypes, made by various collectors including the writer, have been unsuccessful. The locality is a very barren one, made more so by overgrazing by domestic stock in recent years, and if pocket gophers still occur they must be rare as we found no trace of them. The skull of the type specimen of *latirostris*, an old male, has a very broad rostral portion and is believed to be abnormal, as no such character appears in specimens from Tuba City, Winslow, and Oraibi, which are in the same general faunal area. Between the range of *aureus* along the valley of the Little Colorado River and that of the widely different subspecies *fulvus* of the

Mogollon Plateau is an arid belt in which pocket gophers have not been detected.

THOMOMYS BOTTAE PERAMPLUS GOLDMAN

TUNITCHA MOUNTAIN POCKET GOPHER

Thomomys fulvus peramplus Goldman, Jour. Wash. Acad. Sci. 21 (17): 423, October 19, 1931.

Type.—From Wheatfields Creek, west slope of Tunitcha Mountains, Apache County, northeastern Arizona (altitude 7,000 feet); collected by Paul Trapier, June 23, 1927.

General characters.—A large, dark-colored subspecies, closely resembling *apache* of northern New Mexico, but upper parts duller, the sides vinaceous-buff instead of ochraceous-buff; skull more elongated; nasals longer and broader, less wedge-shaped posteriorly. Contrasting strongly with the lighter cinnamon or cinnamon-buff tones of *aureus*, which inhabits parts of the neighboring desert region, in dark, dull coloration, but cranial characters indicate close relationship and the two probably intergrade in places along the basal slopes of the mountains.

Measurements.—Average of four adult male topotypes: Total length, 246 (240-255); tail, 80 (60-90); hind foot, 35 (34-37) millimeters. Average of six adult female topotypes: 230 (225-240); 75 (65-88); 32 (31-33) millimeters.

Distribution and habitat.—The Tunitcha Mountain pocket gopher is known from 7,000 feet altitude on Wheatfields Creek up to 8,000 feet on the upper slope of the range. It also occurs at 7,000 feet altitude in the valley at St. Michaels on the eastern side of the Defiance Plateau. This pocket gopher probably occurs irregularly in suitable places throughout this high mountainous section of the State. It gives way, however, at the higher elevations in the Tunitcha Mountains to *Thomomys talpoides fossor*, which tends toward chestnut color, with large, conspicuous, black ear patches. The general habitat of *peramplus* is in the yellow pine belt of the Transition Zone.

THOMOMYS BOTTAE DESERTORUM MERRIAM

DETRITAL VALLEY POCKET GOPHER

Thomomys desertorum Merriam, Biol. Soc. Wash. Proc. 14: 114, July 19, 1901.

Type.—From Mud Spring, Detrital Valley, Mohave County, Ariz.; collected by Vernon Bailey, February 21, 1889.

General characters.—A small, tawny subspecies, similar in color and closely allied to *desitus* of the Big Sandy River Valley, but smaller.

Measurements.—An adult male: Total length, 200; tail verte-

brae, 68; hind foot, 26 millimeters. Average of four females: 190; 60; 25.5 millimeters.

Distribution and habitat.—This little pocket gopher occupies the Lower Sonoran desert region of the broad Detrital Valley and neighboring areas lying mainly at about 3,500 feet altitude in the angle formed by the bend of the Colorado River north and west of the Hualpai Mountains in the northwestern part of the State. It ranges to a somewhat higher elevation in the Upper Sonoran Zone, however, near its southern limit in the Chemehuevis or Mohave Mountains. East of the northern end of the Hualpai Mountains it doubtless intergrades with *desitus*. The burrows are located in hard upland soil among tree yuccas and a varied assortment of other desert vegetation, including cactuses.

THOMOMYS BOTTAE FULVUS (WOODHOUSE)

FULVOUS POCKET GOPHER

Geomys fulvus Woodhouse, Acad. Nat. Sci. Phila. Proc. 6: 201, 1852.

Thomomys bottae nasutus Hall, Biol. Soc. Wash. Proc. 45: 96, June 21, 1932.

Type from West Fork of Black River, Apache County, Ariz. (altitude 7,550 feet); collected by Annie M. Alexander, June 14, 1931.

Type.—From San Francisco Mountains, Coconino County, Ariz.; collected by S. W. Woodhouse, October 1851.

General characters.—Pocket gophers of medium size, distinguished in the region south of the Grand Canyon by dark, rusty brown coloration associated with that of the dark lava soil they inhabit. Skull with wide-spreading zygomata and small auditory bullae. Closely allied to *mutabilis* of the Verde Valley, but darker, the upper parts more extensively mixed with black; skull less massive; basicranial region narrower; auditory bullae smaller.

Measurements.—Average of five males: Total length, 219; tail vertebrae, 70; hind foot, 30 millimeters. Average of five females: 209; 66; 29.2 millimeters.

Distribution and habitat.—The fulvous pocket gopher is the most widely dispersed of the numerous representatives of the *Thomomys bottae* group found within the State. Its distribution area occupies the whole of the elevated Coconino and Mogollon Plateau regions, extending from the southern rim of the Grand Canyon southeastward to the White Mountains and on far into New Mexico. A spur from the main range reaches south through the high country to the Bradshaw Mountains west of the Verde River Valley. This pocket gopher ranges mainly in the yellow pine forests of the Transition Zone above 5,000 feet altitude, but ascends into the Canadian Zone on San Francisco Mountains and the White Mountains. The general region is marked by cinder

cones and old lava beds, indicating volcanic activity in the past. The decomposing cinders and lava produce dark-colored soils that are reflected in the color tones not only of the pocket gophers but of many of the other small mammals. Along the southern side of the Mogollon Plateau *fulvus* intergrades with *mutabilis*, which ranges at lower levels. On the long gradual desert slope from the top of the plateau toward the Little Colorado River pocket gophers are generally absent, and no direct connection with *aureus*, which inhabits parts of the Little Colorado Valley and Painted Desert, is apparent.

In the yellow pine forests the pocket gophers occur irregularly in colonies wherever there is sufficient soil for their excavations, but they favor the soft soil of open grassy meadows.

THOMOMYS BOTTAE HUALPAIENSIS GOLDMAN

HUALPAI MOUNTAINS POCKET GOPHER

Thomomys bottae hualpaiensis Goldman, Jour. Wash. Acad. Sci. 26 (3): 114, March 15, 1936.

Type.—From Hualpai Peak, Hualpai Mountains, Mohave County, Ariz. (altitude 7,000 feet); collected by E. A. Goldman, October 6, 1917.

General characters.—A light ochraceous buffy subspecies of medium size. Allied to *desitus* of the adjoining valley of the Big Sandy River; similar in size but paler; brain case lower, nasals more wedge-shaped. Compared with *desertorum* of the Detrital Valley: considerably larger and paler.

Measurements.—The type, an adult male: Total length, 245; tail, 78; hind foot, 31.5 millimeters.

Distribution and habitat.—Known only from 6,500 to about 7,500 feet altitude in the Transition Zone on the slopes of the Hualpai Mountains. The burrows occur in soft spots in yellow pine and oak timber.

THOMOMYS BOTTAE DESITUS GOLDMAN

BIG SANDY RIVER POCKET GOPHER

Thomomys bottae desitus Goldman, Jour. Wash. Acad. Sci. 26 (3): 113, March 15, 1936.

Type.—From Big Sandy River, near Owen, Mohave County, Ariz. (altitude 2,000 feet); collected by E. A. Goldman, September 21, 1917.

General characters.—A medium-sized, tawny subspecies; color about as in *desertorum* of the neighboring Detrital Valley region, but size much larger. Size about as in *fulvus* of the Mogollon Pla-

teau, but color lighter, clearer tawny, the back less mixed with black.

Measurements.—An adult male: Total length, 230; tail vertebrae, 70; hind foot, 30.5 millimeters. An adult female: 210; 62; 29.5 millimeters.

Distribution and habitat.—This pocket gopher occupies the Big Sandy River Valley. Thence it ranges east to Kirkland, Yavapai County. Its distribution area is in the Lower Sonoran Zone at 2,000 to 4,000 feet altitude. In the Big Sandy River Valley *desitus* is confined mainly to the loose sand along the broad alluvial river bottom, the excavated mounds of earth often appearing close to the edge of the water where the stream is bordered by willows and *Baccharis* bushes.

THOMOMYS BOTTAE OPEROSUS HATFIELD

PEEPLES VALLEY POCKET GOPHER

Thomomys bottae operosus Hatfield, Chicago Acad. Sci. Bull. 6 (8): 151, January 12, 1942.

Type.—From Peeples Valley, 6 miles north of Yarnell, Yavapai County, Ariz. (altitude 4,400 feet); collected by Roy Komarek, May 30, 1937.

General characters.—From original description: Size large; tips of hairs on back cinnamon to middorsal area which is blackish; sides pinkish buff; top of head blackish; ears surrounded by black; skull broad, with widely spreading zygomata. Differs from *fulvus* in larger size, more widely spreading zygomata, greater mastoid breadth, and heavier dentition. Differs from *mutabilis* in darker color, with more black on nose, occiput, and back. Differs from *patulus* and *desitus* in darker color, longer tail, and more widely spreading zygomata.

Measurements.—From original description: Average of three adult males: Total length, 232.3 (228-237); tail, 81.3 (80-82); hind foot, 29 millimeters. Average of eight adult females: 216.5 (202-234); 71.4 (65-79); 27.4 (26-29) millimeters.

Distribution and habitat.—No specimens of this subspecies have been examined by the writer. It is known only from the type locality and appears to be a local race, perhaps restricted to Peeples Valley, which is somewhat isolated, midway between the desert country of southern Arizona and the high plateau to the northward.

THOMOMYS BOTTAE CHRYSNOTUS GRINNELL

GOLDEN POCKET GOPHER

Thomomys chrysonotus Grinnell, Univ. Calif. Pub. Zool. 10: 174, June 7, 1912.
Thomomys fulvus flavidus Goldman, Jour. Wash. Acad. Sci. 21 (17): 417, October 19, 1931. Type from Parker, Yuma County, Ariz. (altitude 350 feet).

Type.—From Ehrenberg, Yuma County, Ariz.; collected by Frank Stephens, March 27, 1910.

General characters.—A large ochraceous-buff or golden yellowish subspecies with an angular massive skull. Similar to *albatus*, but upper parts ochraceous-buff instead of pinkish buff; skulls much alike; auditory bullae larger, more inflated in *chrysonotus*.

Measurements.—An adult male: Total length, 249; tail vertebrae, 83; hind foot, 33 millimeters. An adult female: 224; 67; 31.5 millimeters.

Distribution and habitat.—The golden pocket gopher occupies the alluvial bottomlands along the east side of the Colorado River from near Ehrenberg north to Parker, and invades the adjoining gravelly mesa overgrown with creosotebush (*Covillea glutinosa*) to some extent. The opposite, or western, side of the Colorado River Valley is inhabited by *Thomomys bottae riparius*, the river serving as a barrier between the two forms. Within the main range of the golden pocket gopher on the bottomlands the burrows are numerous in the soft alluvial soil and extend down in places into the arrowweed (*Pluchea sericea*) belt near the edge of the water.

THOMOMYS BOTTAE SUBSIMILIS GOLDMAN

HARQUAHALA MOUNTAIN POCKET GOPHER

Thomomys fulvus subsimilis Goldman, Biol. Soc. Wash. Proc. 46: 71, April 27, 1933.

Type.—From Harquahala Mountains, Yuma County, Ariz. (altitude 3,000 feet); collected by E. A. Goldman, October 14, 1917.

General characters.—A very small cinnamon-buff animal with a weakly developed skull. Similar to *desertorum* of the Detrital Valley region, but still smaller and paler; skull more delicate in structure.

Measurements.—The type, an adult female: Total length, 186; tail vertebrae, 60; hind foot, 25 millimeters.

Distribution and habitat.—This tiny pocket gopher is known only from a single specimen from 3,000 feet altitude in the Harquahala Mountains. The mountain slopes are rocky, with little soil, but the animal is likely to be found in the softer spots up to near the summit at about 5,000 feet altitude. The mountains are Lower Sonoran in faunal character up to near the top, where a few Upper Sonoran Zone elements appear.

THOMOMYS BOTTAE PATULUS GOLDMAN

HASSAYAMPA VALLEY POCKET GOPHER

Thomomys bottae patulus Goldman, Jour. Wash. Acad. Sci. 28 (7): 341, July 15, 1938.

Type.—From bottomland along Hassayampa River, 2 miles below Wickenburg, Maricopa County, Ariz. (altitude 2,000 feet); collected by Luther C. Goldman, September 16, 1937.

General characters.—A large subspecies, similar to *cervinus* of the Salt River Valley, but upper parts more vivid in color, near cinnamon or cinnamon-buff instead of vinaceous-buff or fawn; skull shorter, less angular. Somewhat resembling *mutabilis* of the Verde River Valley and *desitus* of the Big Sandy River Valley, but larger and paler than either.

Measurements.—An adult male and an adult female topotype, respectively: Total length, 240, 215; tail, 80, 60; hind foot, 31, 29 millimeters.

Distribution and habitat.—Known only from the type locality, but probably has an extensive range in alluvial soil along the valley of the Hassayampa River. The subspecies *patulus* is abundant in alfalfa fields, where it becomes somewhat troublesome to farmers. The distribution of pocket gophers appears to be discontinuous in the arid areas bordering the Hassayampa River Valley.

THOMOMYS BOTTAI MUTABILIS GOLDMAN

VERDE VALLEY POCKET GOPHER

Thomomys fulvus mutabilis Goldman, Biol. Soc. Wash. Proc. 46: 75, April 27, 1933.

Type.—From Camp Verde, Yavapai County, Ariz. (altitude 3,200 feet); collected by Walter P. Taylor, July 25, 1916.

General characters.—A medium-sized, cinnamon-buff subspecies. Closely allied to *fulvus*, but paler, the upper parts less mixed with black; skull more massive; basicranial region broader; auditory bullae larger.

Measurements.—An adult male: Total length, 236; tail vertebrae, 71; hind foot, 31 millimeters. Average of 7 adult females: 216; 68; 29 millimeters.

Distribution and habitat.—The Verde Valley pocket gopher inhabits the valleys and lower slopes of the mountains in the Verde and Salt River drainages along the southern side of the Mogollon Plateau from Camp Verde east to the Gila Mountains, Graham County. Vertical range from about 2,500 to 4,500 feet. This subspecies inhabiting a region arid in general character favors the softer soils along streams.

THOMOMYS BOTTAI CERVINUS ALLEN

FAWN-COLORED POCKET GOPHER; PHOENIX POCKET GOPHER

Thomomys cervinus Allen, Amer. Mus. Nat. Hist. Bull. 7: 203, June 29, 1895.

Type.—From Phoenix, Maricopa County, Ariz. (altitude 1,000 feet); collected by J. Diefenbach, October 20, 1894.

General characters.—A large vinaceous-buff or light fawn-colored subspecies. Similar to *albatus* of the lower Colorado River Valley, but larger; color darker (upper parts near pale pinkish buff or pinkish buff in *albatus*); skull more elongated, with relatively narrower brain case; auditory bullae relatively larger. Allied to *modicus* of the Altar and Santa Cruz Valleys, but larger; color paler (near wood brown, varying to tawny in *modicus*); skull of similar proportions, but much larger, more massive.

Measurements.—Average of three adult male topotypes: Total length, 253 (251-255); tail, 84 (77-90); hind foot, 34.5 (34-36) millimeters. Average of three adult female topotypes: 246 (239-255); 78 (73-81); 34 (33-34.5) millimeters.

Distribution and habitat.—The range of this large pocket gopher is in the Salt River and Gila River Valleys, near Phoenix, and southwest along the latter watercourse to Gila Bend, where it intergrades with the desert subspecies, *aridicola*. The general area is in the Lower Sonoran Zone at from 700 to 1,000 feet altitude. The fawn-colored pocket gopher is associated with such native vegetation as the mesquite (*Prosopis juliflora*), catsclaw (*Aca-cia greggii*), and paloverde (*Cercidium torreyanum*), but with the rapid development of agriculture it has invaded the fields and multiplied greatly in numbers. Owing to the extent of its depredations in an important agricultural area, this pocket gopher should probably be rated as the most destructive of the numerous geographic races that occur within the State.

THOMOMYS BOTTAE PINALENSIS GOLDMAN

PINAL MOUNTAINS POCKET GOPHER

Thomomys bottae pinalensis Goldman, Jour. Wash. Acad. Sci. 23 (7): 342, July 15, 1933.

Type.—From Oak Flat, 5 miles east of Superior, Pinal Mountains, Ariz.; collected by Walter P. Taylor, May 22, 1924.

General characters.—A very small cinnamon subspecies, with a narrow, slenderly formed skull. Most closely allied to *mutabilis* of the adjoining region to the north, but much smaller and darker; skull smaller, narrower, less massive.

Measurements.—The type, an adult female: Total length, 195; tail, 56; hind foot, 24 millimeters.

Distribution and habitat.—The burrows of this small subspecies were noted in numbers in various places along the highway between Superior and Globe across the upper slopes of the Pinal

Mountains. The animal favors the softer soil in small openings in the oak woods of the Upper Sonoran Zone.

THOMOMYS BOTTAE ALIENUS GOLDMAN

UPPER GILA VALLEY POCKET GOPHER

Thomomys bottae alienus Goldman, Jour. Wash. Acad. Sci. 28 (7): 338, July 15, 1938.

Type.—From Mammoth, San Pedro River, Pinal County, Ariz. (altitude 2,400 feet); collected by E. A. Goldman, November 4, 1936.

General characters.—A large, rich rufescent subspecies, allied to *cervinus* of the Salt River Valley, but smaller; upper parts near cinnamon instead of vinaceous-buff. Similar to *toltecus* of the Casas Grandes Valley, northwestern Chihuahua, but color more vivid; skull with lower brain case; upper incisors less projecting forward. Larger, less distinctly tawny than *mutabilis* of the Rio Verde and Salt River drainages.

Measurements.—Average of four adult male topotypes: Total length, 240 (230-254); tail, 68 (58-80); hind foot, 32 (30-33.5) millimeters. Average of four adult female topotypes: 212 (207-218); 58 (57-59); 28 (27.5-28.5) millimeters.

Distribution and habitat.—The general range of this large subspecies is along the bottoms of the lower San Pedro River Valley near Mammoth, and the bottoms of the Gila River Valley above the confluence of the Gila and San Pedro as far as Redrock, New Mex. The area is in the Lower Sonoran Zone from about 2,000 to 3,500 feet or a little more in altitude. These pocket gophers are restricted rather closely to the fertile, alluvial lands along the rivers, overgrown in the natural state with a heavy stand of mesquite (*Prosopis juliflora*) timber.

Economic status.—Much of the alluvial land along the San Pedro and Gila Rivers is cultivated under irrigation, alfalfa being one of the principal crops. The pocket gophers feed upon both the roots and tops of alfalfa and tend to increase in number where a bountiful supply of food is thus provided. Where they become very numerous the alfalfa crop is materially reduced. At Safford the farmers complained of damages to alfalfa, and also of breaks in irrigation ditchbanks caused by gopher tunneling.

THOMOMYS BOTTAE ALBATUS GRINNELL

WHITISH POCKET GOPHER

Thomomys albatrus Grinnell, Univ. Calif. Pub. Zool. 10: 172, June 7, 1912.

Type.—From west side of the Colorado River at old Hanlon Ranch near Pilot Knob, Imperial County, Calif.; collected by Joseph Dixon, May 7, 1910.

General characters.—Distinguished by extremely pallid coloration and rather large size. Upper parts nearly uniform pale pinkish buff, in some specimens appearing almost white. Closely allied to *phasma* of the Tule Desert region, but larger; skull more massive.

Measurements.—An adult male: Total length, 272; tail vertebrae, 100; hind foot, 35 millimeters. An adult female: 264; 91; 34 millimeters.

Distribution and habitat.—This nearly white subspecies inhabits both sides of the lower Colorado River Valley from the vicinity of Yuma, at least, to points in the Delta. It burrows in soft alluvial soil, and local occurrence points to the transfer of colonies from one side to the other with the frequently changing channels of the river. Across the lowlands of the Delta, therefore, the general range of *albatus* appears to be the connecting link in a chain of subspecies of the *Thomomys bottae* group extending from the Pacific coast to the Rio Grande Valley in Texas.

THOMOMYS BOTTAE DEPAUPERATUS GRINNELL AND HILL

TINAJAS ALTAS POCKET GOPHER

Thomomys perpallidus depauperatus Grinnell and Hill, Jour. Mammal. 17 (1): 4, February 17, 1936.

Type.—From the east base of the Tinajas Altas Mountains, 7 miles south of Raven Butte, Yuma County, Ariz. (altitude 1,150 feet); collected by Annie M. Alexander, January 17, 1934.

General characters.—Distinguished by pale pinkish buff coloration combined with small size. Color about as in the geographic neighbors *albatus* and *phasma*, but smaller than either (much smaller than *albatus*); skull weaker in structure, less angular than in *phasma*; zygomata more slender; nasals relatively shorter.

Measurements.—A representative female (from original description): Total length, 188; tail, 60; hind foot, 28 millimeters.

Distribution and habitat.—Known only from a small colony in the desert along the eastern base of the Tinajas Altas Mountains, a southern extension of the Gila Mountains, and about 4 to 5 miles north of the Mexican Boundary. It is reported to inhabit gravelly soil along the margins of washes, where the mesquite (*Prosopis juliflora*) and catsclaw (*Acacia greggii*) are among the dominant woody plants.

THOMOMYS BOTTAE PHASMA GOLDMAN

TULE DESERT POCKET GOPHER

Thomomys fulvus phasma Goldman, Biol. Soc. Wash. Proc. 46: 72, April 27, 1933.

Type.—From 2 miles south of Tule Tank, Tule Desert, Yuma

County, Ariz. (altitude 1,200 feet); collected by E. A. Goldman, December 8, 1913.

General characters.—One of the palest of the known forms of the genus. Upper parts near pale pinkish buff, scarcely modified by dark-tipped hairs. Closely allied to *albatus* of the Colorado Delta region, but smaller; skull less massive.

Measurements.—An adult female: Total length, 199; tail vertebrae, 66; hind foot, 29 millimeters.

Distribution and habitat.—The Tule Desert pocket gopher occurs irregularly so far as known in small, local colonies on the low Lower Sonoran plains from the vicinity of the type locality near the Mexican Boundary northwest to Wellton, Yuma County. Its habitat on the desert is in one of the most arid regions in North America. The burrows are found along washes and in open stands of desert vegetation, including the creosotebush (*Covillea tridentata*), ironwood (*Olneya tesota*), palo verde (*Cercidium torreyanum*), and giant cactus (*Carnegiea gigantea*). Numerous mounds of earth pushed out near together at about the same time are evidences of periodical activity, apparently following rains, which are infrequent in the region. Periodical excavation of earth on an extensive scale is a characteristic of pocket gophers in general that seems emphasized in this and some of the other desert forms. During the long intervals between rains the animals remain in the deeper underground workings, and there is little evidence of activity on or near the surface. At such times tunnels near the surface are generally plugged for several feet, or show signs of disuse. To obtain specimens of the gophers may involve considerable labor, as under such conditions it may be necessary to dig a trench 2 to 3 feet deep with a shovel in order to reach the used tunnels where traps can be set with excellent results.

THOMOMYS BOTTAE ARIDICOLA HUEY

GILA BEND POCKET GOPHER

Thomomys bottae aridicola Huey, San Diego Soc. Nat. Hist. Trans. 8 (25): 354, June 15, 1937.

Type.—From 10 miles south of Gila Bend (or, exactly, on Ajo Railroad right-of-way, about 2 miles north of Black Gap), Maricopa County, Ariz. (altitude 900 feet); collected by Laurence M. Huey, February 1, 1936.

General characters.—A medium-sized, light buffy, desert subspecies. Similar to *cervinus* of the Salt River Valley, but smaller and color of upper parts shading toward cinnamon-buff instead of vinaceous-buff.

Measurements.—Type, an adult female: Total length, 212; tail, 63; hind foot, 29 millimeters.

Distribution and habitat.—The type and a topotype of this pocket gopher came from close along the Ajo Railroad, 2 miles north of Black Gap, and 10 miles south of Gila Bend, Maricopa County, Ariz. The animal appears to be one of the isolated forms that exist as local colonies in the wide expanse of Lower Sonoran desert.

THOMOMYS BOTTAE GROWLERENSIS HUEY

GROWLER VALLEY POCKET GOPHER

Thomomys bottae growlerensis Huey, San Diego Soc. Nat. Hist. Trans. 8 (25): 353, June 15, 1937.

Type.—From 7 miles east of Papago Well, Pima County, Ariz. (or, exactly, along a well wooded desert wash on the southwestern side of a range of hills in the southern end of Growler Valley; the Agua Dulce Mountains form the southern boundary of this locality and are not far distant); collected by Laurence M. Huey, March 16, 1937.

General characters.—A desert form, closely allied to *phasma* of the Tule Desert to the west, but darker, deeper pinkish buff or yellowish in color. Much lighter colored in comparison with *modicus* of the Altar Valley to the east.

Measurements.—Type, an adult male: Total length, 208; tail, 62; hind foot, 30 millimeters.

Distribution and habitat.—The known range of this denizen of the desert includes several localities from the southern end of Growler Valley and Quitobaquito north to Bates Well in Growler Pass, between the Growler Mountains and Bates Mountains, all in the Lower Sonoran Zone. The burrows are usually found in soft soil along gravelly wooded washes where the ironwood (*Oleña tesota*), mesquite (*Prosopis*), catsclaw (*Acacia greggii*), and paloverde (*Cercidium torreyanum*) are among the dominant woody plants.

THOMOMYS BOTTAE COMOBABIENSIS HUEY

COMOBABI POCKET GOPHER

Thomomys bottae comobabiensis Huey, San Diego Soc. Nat. Hist. Trans. 8 (25): 354, June 15, 1937.

Type.—From 5 miles northwest of Sells, Pima County, Ariz. (altitude 2,400 feet); collected by Laurence M. Huey, March 22, 1937.

General characters.—A medium-sized, distinctly brownish subspecies. Similar in color to *modicus* of the Altar Valley, but somewhat smaller; skull with larger, more fully inflated, auditory bullae.

Measurements.—The type, an adult female: Total length, 215;

tail, 70; hind foot, 28 millimeters.

Distribution and habitat.—Known only from the type locality on the basal slope of the Comobabi Mountains. Like some of the other desert representatives of the genus, this form appears to be very local in distribution. More abundant material for study may show close alliance to *modicus* to which specimens from Sells are referred.

THOMOMYS BOTTAE PUSILLUS GOLDMAN

COYOTE MOUNTAIN POCKET GOPHER

Thomomys fulvus pusillus Goldman, Jour. Wash. Acad. Sci. 21 (17): 422, October 19, 1931.

Type.—From Coyote Mountains, Pima County, Ariz. (altitude 3,000 feet); collected by E. A. Goldman, September 4, 1915.

General characters.—A small, rich ochraceous-tawny form with a slender, delicate skull and large, fully distended, auditory bullae. Mammae, pectoral two pairs, inguinal two pairs. Allied to *modicus* of the neighboring valleys, but much smaller; color more tawny.

Measurements.—The type, an adult female: Total length, 201; tail vertebrae, 65; hind foot, 27.5 millimeters.

Distribution and habitat.—As the name implies, this is a very small pocket gopher. It is known only from a spot where a little soil had accumulated at 3,000 feet altitude in the exceedingly rocky Coyote Mountains. It is associated with the catsclaw (*Aca-cia greggii*), mesquite (*Prosopis juliflora*), and other vegetation of the Lower Sonoran Zone.

THOMOMYS BOTTAE GRAHAMENSIS GOLDMAN

GRAHAM MOUNTAINS POCKET GOPHER

Thomomys fulvus grahamensis Goldman, Jour. Wash. Acad. Sci. 21 (17): 420, October 19, 1931.

Type.—From Graham Mountains (=Pinaleno Mountains), Graham County, Ariz. (altitude 9,200 feet); collected by Ernest G. Holt, June 7, 1914.

General characters.—A dark, high-mountain subspecies, resembling *fulvus* of the Mogollon Plateau region, but upper parts near ochraceous-buff instead of ochraceous-tawny, but as in *fulvus* rather heavily mixed with black; skull narrower, with zygomata less widely spreading. About like *collinus* of the Chiricahua Mountains in color; skull narrower, but interorbital region broader.

Measurements.—An adult male: Total length, 231; tail vertebrae, 71; hind foot, 29 millimeters. An adult female: 228; 76; 28 millimeters.

Distribution and habitat.—This subspecies is known only from the forested upper slopes (6,100 to 9,200 feet altitude) of the Graham Mountains, which like other ranges of the general region, rise steeply, island-like, from arid surrounding plains and valleys. This pocket gopher burrows in soft soil in the Transition Zone, and is numerous in the grassy high mountain meadows bordered by firs (*Pseudotsuga*) and spruces (*Picea*) in the Canadian Zone along the crest of the range. Pocket gophers from Fort Grant at the west base are closely allied to *grahamensis*, but are much paler and are referred to *extenuatus*. Along the arid, eastern basal slopes of the Graham Mountains pocket gophers are scarce or absent, and *grahamensis* contrasts strongly with *alienus*, which is abundant along the Gila Valley.

THOMOMYS BOTTAE EXTENUATUS GOLDMAN

SULPHUR SPRINGS VALLEY POCKET GOPHER

Thomomys bottae extenuatus Goldman, Biol. Soc. Wash. Proc. 48: 149, October 31, 1935.

Type.—From Willcox, Cochise County, Ariz. (altitude 4,000 feet); collected by Vernon Bailey, November 27, 1889.

General characters.—This small cinnamon-buff or light tawny pocket gopher, with strongly decurved upper incisors and large auditory bullae, is allied to several neighboring forms from all of which it differs in combination of size, color, and skull structure. Similarity in color of *extenuatus* to *alienus* of the lower elevations along the San Pedro and Gila River Valleys is evident, but the smaller general size and more swollen auditory bullae of *extenuatus* are distinctive. *Extenuatus* is about the same in size as, and evidently related to, the neighboring high-mountain forms *grahamensis*, *collinus*, *catalinae*, and *hueyi* but differs from all in lighter color and cranial details. In size and color *extenuatus* closely approaches *Thomomys baileyi mearnsi*, and the two occur together in places; *extenuatus* may be recognized by the higher brain case and heavier dentition, and the upper incisors are more strongly recurved instead of projecting forward beyond the nasals as in *mearnsi*.

Measurements.—An adult male and an adult female topotype, respectively: Total length, 203, 198; tail, 67, 67; hind foot, 27.5, 29 millimeters.

Distribution and habitat.—The range of *extenuatus* embraces the desert plains and the basal mountain slopes bordering the Sulphur Springs Valley, and adjoining valleys near the top of the Continental Divide, extending east into the San Simon Valley, north to Fort Grant, and west across the upper part of the San

Pedro Valley to Oracle. The general area lies near the boundary between the Upper and Lower Sonoran Zones. In this region, as near Willcox, the ranges of *extenuatus* and *mearnsi*, which are regarded as representatives of distinct species, interdigitate, and careful examination of skulls may be necessary to distinguish them.

THOMOMYS BOTTAE CATALINAE GOLDMAN

SANTA CATALINA POCKET GOPHER

Thomomys fulvus catalinae Goldman, Jour. Wash. Acad. Sci. 21 (17): 419, October 19, 1931.

Type.—From Summerhaven, Santa Catalina Mountains, Pima County, Ariz. (altitude 7,500 feet); collected by E. A. Goldman, August 6, 1923.

General characters.—A small, notably dark-colored subspecies, the upper parts tawny, heavily mixed with black. Closely allied to *hueyi* of the Rincon Mountains, but darker in color, the upper parts more profusely mixed with black, and the under parts having a darker buff tone. Closely resembles *collinus* of the Chiricahua Mountains in dark color, but skull flatter and narrower; zygomatica less widely spreading.

Measurements.—Average of four adult male topotypes: Total length, 211 (204-220); tail vertebrae, 64 (58-72); hind foot, 28.5 (27.5-30) millimeters. Average of four adult female topotypes: 202 (196-212); 59 (55-62); 25 (24-26) millimeters.

Distribution and habitat.—This richly colored pocket gopher is restricted to the upper slopes of the Santa Catalina Mountains, where it burrows in the soft, gravelly soil in rather open stands of timber, largely yellow pines and oaks, in the Transition Zone at 7,000 to 8,000 feet altitude. It also occurs, however, among Canadian Zone elements nearer the summit of Mount Lemmon. The oak belt along the northern basal slope of these mountains, at Oracle, is inhabited by pocket gophers obviously closely related to the present form, but that in color are more like *extenuatus*, to which they are referred. The Santa Catalina Mountains are connected across a saddle or pass with the Rincon Mountains, the upper slopes of which are occupied by the closely related, but paler, form *hueyi*. Mountainous masses of nearly solid rock tend to separate the two, and the well marked, small, local form *parvulus* is interposed in a series of shallow, rock-bound depressions filled with stony soil in the pass. Pocket gophers appear to be absent in a broad, arid belt along the southern side of the Santa Catalina Mountains, and no evidence of intergradation with *modicus*, which is common along the Santa Cruz River near Tucson, is found.

THOMOMYS BOTTAE PARVULUS GOLDMAN

INTERMOUNTAIN POCKET GOPHER

Thomomys bottae parvulus Goldman, Jour. Wash. Acad. Sci. 28 (7): 339, July 15, 1938.

Type.—From the pass between the Santa Catalina and Rincon Mountains, Pima County, Ariz. (altitude 4,500 feet); collected by Luther C. Goldman, June 5, 1937.

General characters.—A very small cinnamon or tawny subspecies; mammae, pectoral two pairs, inguinal two pairs. Allied to *catalinae* of the upper slopes of the closely adjoining Santa Catalina Mountains, and to *hueyi* of similar proximity in the Rincon Mountains, but much smaller than either, color lighter, more inclining toward tawny.

Measurements.—Two adult male topotypes, respectively: Total length, 203, 211; tail, 60, 57; hind foot, 27, 25 millimeters. Two adult female topotypes, respectively: 190, 188; 56, 55; 25, 25 millimeters.

Distribution and habitat.—These diminutive pocket gophers are apparently restricted in range to gravelly pockets in the granitic formation in the pass between the Santa Catalina and Rincon Mountains. Here they are numerous, although the soil is so thin and scanty that gopher excavations consist largely of pebbles. Massive rock exposures in the vicinity may be effective barriers limiting distribution. The area, at 4,000 to 4,500 feet altitude, is near the boundary between the Upper Sonoran and Lower Sonoran Zones, as shown by overlapping floral elements. The Upper Sonoran Zone is represented by the lower edge of the oaks (*Quercus arizonica* and *Q. emoryi*), but along these is a thin stand of mesquite (*Prosopis juliflora*), catsclaw (*Acacia greggii*), and desertwillow (*Chilopsis linearis*).

THOMOMYS BOTTAE HUEYI GOLDMAN

RINCON MOUNTAINS POCKET GOPHER

Thomomys bottae hueyi Goldman, Jour. Wash. Acad. Sci. 28 (7): 340, July 15, 1938.

Type.—From Spud Rock Ranger Station, Rincon Mountains, Pima County, Ariz. (altitude 7,400 feet); collected by Laurence M. Huey, June 17, 1932.

General characters.—A small, cinnamon subspecies, closely allied to *catalinae* of the adjoining Santa Catalina Mountains, but upper parts less profusely mixed with black, and under parts a lighter buff tone. Larger than its near neighbor *parvulus*, which occupies the pass between the Rincon Mountains and Santa Catalina Mountains; color darker, less tawny.

Measurements.—Two adult male topotypes, respectively: Total length, 220, 220; tail, 62, 66; hind foot, 30, 29 millimeters. Two adult female topotypes, respectively: 198, 196; 60, 60; 26, 27 millimeters.

Distribution and habitat.—In the Rincon Mountains *hueyi* is known from the Transition Zone near the top at 7,400 to 7,900 feet altitude. Pocket gophers that appear to be referable to this subspecies are also found at about 7,000 feet altitude in Ramsay Canyon and in the head of Miller Canyon in the Huachuca Mountains. The same subspecies may inhabit the Whetstone Mountains and elevated plains between the two localities mentioned. In the Rincon Mountains massive rock exposures apparently separate the habitat of *hueyi* from that of *parvulus* in the pass connecting this range with the Santa Catalina Mountains.

THOMOMYS BOTTAE COLLINUS GOLDMAN

CHIRICAHUA MOUNTAIN POCKET GOPHER

Thomomys fulvus collinus Goldman, Jour. Wash. Acad. Sci. 21 (17): 421, October 19, 1931.

Thomomys umbrinus chiricahuae Nelson and Goldman, Jour. Mammal. 15 (2): 117, May 15, 1934. Type from Pinery Canyon, Chiricahua Mountains, Ariz. (altitude 7,500 feet).

Type.—From Fly Park, Chiricahua Mountains, Cochise County, Ariz. (altitude 9,000 feet); collected by A. K. Fisher, June 10, 1894.

General characters.—A dark, high-mountain subspecies, resembling *catalinae* of the Santa Catalina Mountains and *grahamensis* of the Graham Mountains, but skull differing in more widely spreading zygomata and other details. Pectoral mammae, normally two pairs, but they may vary to one pair.

Measurements.—Average of five adult males: Total length, 213 (207-222); tail vertebrae, 58 (50-60); hind foot, 28.3 (27-30) millimeters.

Distribution and habitat.—Like some other high-mountain forms of the general region, this pocket gopher is restricted to a single mountain range, and in this case the Chiricahua Mountains. It ranges from the mouths of Cave and Turkey Creeks at about 5,000 feet altitude on the eastern and western sides, respectively, to the extreme summit of Fly Peak, at 9,700 feet, but is most abundant in the soft, dark soil of mountain meadows, such as Rustler Park, at 8,500 feet altitude in the Canadian Zone. Specimens from the lower elevations are somewhat paler and approach *extenuatus* of the Sulphur Springs Valley region. A few specimens from 7,500 feet in Pinery Canyon are small, and as only one pair of pectoral mammae was found, they were described as *Thomomys umbrinus*

chiricahuae, but the number of these mammae proves to vary from normal in some individuals. Additional specimens of *collinus* indicate that the characters ascribed to *chiricahuae* are within the range of individual variation in that form.

THOMOMYS BOTTAE MODICUS GOLDMAN

ALTAR VALLEY POCKET GOPHER

Thomomys fulvus modicus Goldman, Jour. Wash. Acad. Sci. 21 (17): 418, October 19, 1931.

Type.—From La Osa (near Mexican Boundary), southern end of Altar Valley, Pima County, Ariz.; collected by E. A. Mearns and F. X. Holzner, December 14, 1893.

General characters.—A dark-colored subspecies of medium size. Closely allied to *cervinus* of the Salt River Valley, but smaller; upper parts near wood brown or cinnamon, varying to rich tawny instead of vinaceous-buff or fawn color; skull more slender.

Measurements.—Average of four adult male topotypes: Total length, 214 (204-222); tail vertebrae, 67 (55-75); hind foot, 28 (25.5-30) millimeters. Average of six female topotypes: 208 (198-224); 69 (60-74); 27.5 (26.5-28) millimeters.

Distribution and habitat.—The general range of this subspecies includes the Altar Valley, the upper part of the Santa Cruz River Valley, and neighboring valleys and desert plains as far west as Sells, and east to Fort Huachuca. The altitudinal limits are from about 2,500 to about 4,500 feet, mainly in the upper part of the Lower Sonoran Zone. The vegetation consists prominently of mesquite (*Prosopis juliflora*), catsclaw (*Acacia greggii*), palo-verde (*Cercidium torreyanum*), creosotebush (*Covillea tridentata*), and many cactuses. The gophers range up in places, however, along the basal slopes of the mountains into the lower edge of the oaks (*Quercus emoryi* and *Quercus arizonica*), marking the Upper Sonoran Zone. Distribution, as in many other forms of the group, is not continuous. These pocket gophers exhibit a preference for the softer soils along streams and dry washes, which may be separated by many miles of unoccupied desert. Along the lower slopes of the Santa Rita and Huachuca Mountains, *modicus* meets the range of *Thomomys umbrinus proximus*, regarded as a representative of a distinct species.

THOMOMYS ALEXANDRAE GOLDMAN

NAVAJO POCKET GOPHER

Thomomys alexandrae Goldman, Jour. Wash. Acad. Sci. 23 (10): 464, October 15, 1933.

Type.—From 5 miles southeast of Rainbow Lodge, near Navajo

Mountain, Coconino County, Ariz. (altitude 6,200 feet) ; collected by E. A. Goldman, June 16, 1933.

General characters.—An apparently distinct species of the *Thomomys bottae* group, allied to *aureus* of the adjoining desert region, but decidedly smaller; color much duller, near cinnamon-buff instead of rich ochraceous-tawny; skull flatter and slenderer, with more widely separated temporal ridges.

Measurements.—An adult male: Total length, 210; tail, 60; hind foot, 28 millimeters. An adult female: 215; 70; 27 millimeters.

Distribution and habitat.—The Navajo pocket gopher is common in places on the nearly flat sagebrush-covered mesa at 6,200 feet altitude south of Navajo Mountain. It has also been recorded by Benson (Univ. Calif. Pub. Zool. 40: 449, Dec. 31, 1935) from near Soldier Spring at 8,600 feet on Navajo Mountain, just across the Utah line. The species appears to be isolated in a somewhat triangular area between the precipitous walls of Navajo and Pinto Creek canyons which diverge to the Colorado River. Along the narrow divide between the upper courses of these creeks the solid bedrock formation is nearly bare of soil for miles. None of the characteristic gopher mounds was seen, and this barren ridge, as well as the canyons, may have served as an effective barrier isolating the habitat of *alexandrae* for thousands of years.

THOMOMYS SUBOLES GOLDMAN

SEARCHLIGHT FERRY POCKET GOPHER

Thomomys fulvus suboles Goldman, Biol. Soc. Wash. Proc. 41: 203, December 18, 1928.

Type.— From Old Searchlight Ferry, Colorado River, northwest of Kingman, Mohave County, Ariz. (altitude 600 feet) ; collected by Luther C. Goldman, September 26, 1923.

General characters.—A small, light-colored species, allied to *desertorum* of the Detrital Valley, but more ochraceous-tawny; skull more angular, narrower, but heavier in detail; maxillary arms of zygomata much broader, with acutely projecting lateral angles; auditory bullae more compressed laterally, less rounded.

Measurements.—An adult male: Total length, 227; tail vertebrae, 75; hind foot, 30 millimeters. An adult female: 194; 62; 26.5 millimeters.

Distribution and habitat.—In an embayment of the escarpment flanking the Colorado River, near Old Searchlight Ferry, above Pyramid Canyon, and northwest of Kingman, Ariz., are alluvial bottoms extending for several miles until interrupted by cliffs

rising abruptly from the water. The bottoms, consisting of soft, sandy soil, are overgrown with mesquite (*Prosopis*), catsclaw (*Acacia greggii*), and other Lower Sonoran Zone vegetation. The pocket gophers have become isolated here in a narrow belt between the river and the escarpment, which arises steeply to the crest of a rocky ridge at about 3,500 feet altitude. These pocket gophers have evidently found their restricted habitat congenial as attested by their numbers. The distribution and habitat of *suboles* in relation to other species have been discussed in detail by Grinnell and Hill (Jour. Mammal. 17 (1) : 7-10, Feb. 17, 1936), who refer to the occurrence of a quite different subspecies, *Thomomys bottae centralis*, on the opposite side of the Colorado River, although the two forms live under similar conditions of soil, climate, and food.

THOMOMYS MURALIS GOLDMAN

GRAND CANYON POCKET GOPHER

Thomomys muralis Goldman, Jour. Wash. Acad. Sci. 26 (3) : 112, March 15, 1936.

Type.—From lower end of Prospect Valley, Grand Canyon, Hualpai Indian Reservation, Ariz. (altitude 4,500 feet) ; collected by E. A. Goldman, October 3, 1913.

General characters.—A diminutive ochraceous buffy or somewhat tawny species, similar in size and in color to, and closely resembling, *desertorum*, but cranial characters distinctive; brain case more rounded and inflated, the basicranial region tending to bulge more prominently posteriorly; frontal region broader; upper incisors more strongly recurved. Differs from *fulvus* in lighter color, and smaller size, the skull more delicate in structure and exhibiting a departure in about the same details as from *desertorum*.

Measurements.—Type, an adult male: Total length, 194; tail, 64; hind foot, 26 millimeters. Two adult female topotypes, respectively: 182, 190; 57, 56; 24.5, 25.5 millimeters.

Distribution and habitat.—Isolated on terraces along the inner gorge below the outer rim in Prospect Valley, a lateral pocket within the Grand Canyon, near the eastern end of the Hualpai Indian Reservation. The geographic isolation of *muralis* in the Grand Canyon appears to be complete, and characters presented suggest full specific rank. In places it was found inhabiting strips of soil on ledges only a few feet wide, bounded above and below by vertical cliffs hundreds of feet high. *Zonal range*: Upper Sonoran.

THOMOMYS HARQUAHALAE GRINNELL AND HILL

RANEGRAS PLAIN POCKET GOPHER

Thomomys harquahalae Grinnell and Hill, Jour. Mammal. 17 (1): 7, February 17, 1936.

Type.—From Ranegras Plain, 10 miles west of Hope, Yuma County, Ariz. (altitude about 1,250 feet); collected by Louise Kellogg, February 27, 1934.

General characters.—A large pinkish buff species; skull with widely spreading zygomata and anteriorly projecting upper incisors. Not very closely allied to any other known form, and therefore accorded full specific status. Similar to *chrysonotus* of the Colorado River Valley, but paler (cinnamon-buff in *chrysonotus*); zygomata wider; upper incisors strongly procumbent instead of strongly decurved; auditory bullae shorter, more rounded, less projecting below plane of basioccipital.

Measurements.—An adult male: Total length, 236; tail vertebrae, 69; hind foot, 31 millimeters. An adult female: 210; 62; 29.5 millimeters.

Distribution and habitat.—Known only from a colony along the highway where it crosses the lowest part of the broad open grassy Ranegras Plain west of Hope. The soil in which these pocket gophers burrow is compact in texture and difficult to perforate, suggesting a possible special use for the forward-curving incisors. Many mounds, marking excavations in the highway embankment, where food appears to be scanty, indicate that the animals welcome a change from the hard soil of their natural habitat.

SUBSPECIES OF THOMOMYS BAILEYI GROUP

THOMOMYS BAILEYI MEARNSI BAILEY

MEARNS POCKET GOPHER

Thomomys mearnsi Bailey, Biol. Soc. Wash. Proc. 27: 117, July 10, 1914.

Type.—From Gray's Ranch, Animas Valley, southwest corner of Grant County, N. Mex.; collected by E. A. Goldman, August 10, 1908.

General characters.—This subspecies, a near relative of typical *baileyi* of western Texas, requires close comparison with *extenuatus*, a form of the *bottae* group in Arizona, as the ranges of the two meet or interdigitate. In cinnamon-buff or light tawny coloration *mearnsi* resembles *extenuatus*, and for differential characters recourse must be had to the skull, which is very similar in general, but relatively broader with a somewhat lower, flatter brain case, a combination of characters apparently indicating group relationship. In *mearnsi* the dentition is lighter, the upper

incisors narrower, more projecting forward beyond the nasals.

Measurements.—Type, adult male, and an adult female topotype, respectively: Total length, 220, 201; tail, 67, 65; hind foot, 31, 29 millimeters.

Distribution and habitat.—The range of *mearnsi* extends from the Animas Valley, southwestern New Mexico, into the elevated plains region mainly in the lower part of the Upper Sonoran Zone of southeastern Arizona. Specimens were obtained in soft moist ground along a small stream at San Bernardino, near the Mexican Boundary and on the open plain near Willcox in the Sulphur Springs Valley. While *mearnsi* and *extenuatus* appear to be typically quite distinct, their general ranges meet or interdigitate and specimens from San Simon Valley suggest the possibility of hybridism. The exact habitat relations of the two forms remain, therefore, to be determined.

SUBSPECIES OF THOMOMYS TALPOIDES GROUP

THOMOMYS TALPOIDES KAIBABENSIS GOLDMAN

KAIBAB PLATEAU POCKET GOPHER

Thomomys fossor kaibabensis Goldman, Jour. Wash. Acad. Sci. 28 (7): 333, July 15, 1938.

Type.—From DeMotte Park, Kaibab Plateau, Ariz. (altitude 9,000 feet); collected by Luther C. Goldman, September 10, 1937.

General characters.—Resembles *fossor* of southwestern Colorado, but larger, less rufescent; skull with more widely spreading zygomata; interparietal smaller; auditory bullae larger; upper incisors broader, less recurved.

Measurements.—An adult male and an adult female topotype, respectively: Total length, 238, 230; tail, 58, 77; hind foot, 31, 30 millimeters.

Distribution and habitat.—The Kaibab Plateau pocket gopher appears to be restricted to the higher parts of the well forested Kaibab Plateau, which rises island-like from arid plains or broad valleys toward the north and presents a sheer face along the north side of the deepest part of the Grand Canyon. This pocket gopher occurs irregularly in local colonies mainly in the Canadian Zone at 8,500 to 9,000 feet altitude. These animals are numerous in the soft soil in DeMotte Park near the top of the plateau, an open grassy meadow several miles in length, bordered by fir, spruce, and aspen forest. Specimens have also been taken near the northern rim of the Grand Canyon.

General habits.—In DeMotte Park, on the Kaibab Plateau, when the deep snow of winter melts away, many lines of earth 5 to 10

feet in length, with branches, are revealed radiating from the entrances to the burrows of the gophers. These cylindrical dumps, in addition to the usual mounds, are evidence of burrowing operations late in winter that seem to be followed in spring by a period of comparative inactivity.

THOMOMYS TALPOIDES FOSSOR ALLEN

ROCKY MOUNTAIN POCKET GOPHER

Thomomys fossor Allen, Amer. Mus. Nat. Hist. Bull. 5: 51, April 28, 1893.

Type.—From Florida, La Plata County, Colo. (altitude 7,200 feet); collected by Charles P. Rowley, June 25, 1892.

General characters.—Small pocket gophers, characterized by the chestnut brown overtone of the top of head and back and conspicuous black ear patches; skull (compared with *bottae* group) narrow, with widely separated temporal ridges; interparietal triangular; zygomata depressed posteriorly, the jugal sloping upward to join maxilla anteriorly; auditory meatus large and prominent.

Measurements.—An adult male and an adult female, respectively, from the Lukachukai Mountains: Total length, 212, 210; tail, 70, 60; hind foot, 30, 28 millimeters.

Distribution and habitat.—The Rocky Mountain pocket gopher is a denizen of the upper slopes of high mountains. In Arizona *fossor* is known only from about 8,000 to 9,000 feet altitude, mainly in the Canadian Zone, near the tops of the Tunitcha and Lukachukai Mountains in the northeastern corner of the State. Here its range seems to meet that of *Thomomys bottae peramplus*, which extends from the lower slopes upward to about 8,000 feet, but the two forms are not known to occupy the same local terrain.

SUBSPECIES OF THOMOMYS UMBRINUS GROUP

THOMOMYS UMBRINUS PROXIMUS BURT AND CAMPBELL

ARIVACA POCKET GOPHER

Thomomys burti proximus Burt and Campbell, Jour. Mammal. 15 (2): 151, May 15, 1934.

Type.—From Old Parker Ranch (Pickett's Ranch on U. S. Geological Survey topographic map, Patagonia Quadrangle, edition of August 1905), altitude 4,800 feet, west slope of Santa Rita Mountains, Pima County, Ariz.; collected by W. H. Burt, June 9, 1931.

General characters.—A small, pale russet-colored form, similar to *Thomomys umbrinus burti* of the upper slopes of the Santa Rita Mountains. Some specimens are not very unlike *Thomomys bottae modicus* of the neighboring plains, representing a distinct species;

pectoral mammae, sometimes two pairs, as in *modicus*; skull more slender, with narrower nasals and smaller auditory bullae. Similar in size to *burti*, but upper parts paler, less deep russet, with a less well defined, less uniformly darkened median dorsal area; skull very similar.

Measurements.—Type, an adult female: Total length, 193; tail, 61; hind foot, 25 millimeters. Two adult males, respectively, from Fort Huachuca: 200, 195; 59, 54; 27, 26 millimeters.

Distribution and habitat.—A few specimens have been taken at the type locality on the west slope of the Santa Rita Mountains, at the Empire Ranch, east of these mountains, at Fort Huachuca, and at Arivaca. At Arivaca, W. P. Taylor collected two specimens on the same day, one of which is referred to *proximus* and the other to typical *modicus*, a representative of a species regarded as distinct. Of 20 specimens from the Empire Ranch, 19 are nearly typical *modicus*, but one is referred to *proximus*. This single individual was also obtained by Taylor on the same day and at the same recorded altitude (4,632 feet) as an example of *modicus*. The occurrence of two species of pocket gophers regarded as distinct in such close proximity is unusual. *Zonal range*: Upper Sonoran, as indicated by open stands of oaks (*Quercus emoryi* and *Quercus arizonica*); altitude, 4,500 to 4,800 feet.

THOMOMYS UMBRINUS BURTI HUEY

SANTA RITA MOUNTAIN POCKET GOPHER

Thomomys burti Huey, San Diego Soc. Nat. Hist. Trans. 7 (15): 158, July 28, 1932.

Type.—From Madera Canyon, Santa Rita Mountains, Santa Cruz County, Ariz. (altitude 6,000 feet); collected by W. H. Burt, May 29, 1931.

General characters.—A small, dark subspecies, with a coloration unusual except in closely allied forms; upper parts between cinnamon and cinnamon-brown or russet, becoming uniformly blackish along the moderately broad, well defined median area from top of head to rump; skull small, brain case smoothly rounded; nasals wedge-shaped, emarginate posteriorly; auditory bullae small; mammae, pectoral one pair, inguinal two pairs. Closely allied to *intermedius* of the upper slopes of the Huachuca Mountains; color slightly paler, dentition heavier.

Measurements.—An adult male and an adult female topotype, respectively: Total length, 217, 200; tail, 60, 61; hind foot, 27.5, 26 millimeters.

Distribution and habitat.—Restricted to the Santa Rita Mountains, southern Arizona. *Zonal range*: from 4,500 feet altitude in

the Upper Sonoran Zone near the mouth of Madera Canyon up to 8,000 feet in the Transition Zone near the summit. The burrows are located in the softer soil, usually in small open meadows.

THOMOMYS UMBRINUS QUERCINUS BURT AND CAMPBELL

PAJARITO MOUNTAIN POCKET GOPHER

Thomomys burti quercinus Burt and Campbell, Jour. Mammal. 15 (2): 150, May 15, 1934.

Type.—From Peña Blanca Spring, Pajarito Mountains, Ariz. (altitude 4,500 feet, near Mexican Boundary, north of Monument 128); collected by Berry Campbell, July 15, 1933.

General characters.—A small, cinnamon subspecies; mammae, pectoral one pair, inguinal two pairs. Closely allied to *proximus*, but still smaller; coloration of the same pattern and general tones; skull smaller, more delicate in structure; nasals slightly shorter, reaching anterior plane of zygomata.

Measurements.—An adult male topotype: Total length, 198; tail, 60; hind foot, 27 millimeters. Type, female, and an adult female topotype, respectively: 193, 182; 61, 56; 25, 25 millimeters.

Distribution and habitat.—The known range of this close relative of *proximus* is from 4,500 feet altitude at the type locality in the Pajarito Mountains to about 6,000 feet in the pass over the summit of the Patagonia Mountains. Both localities are in the oak belt in the Upper Sonoran Zone. At Peña Blanca Spring burrows indicating a small colony were found in gravelly soil along a broad wash. At the time of the writer's visit in June the ground was very dry, no fresh gopher excavations were in evidence, and specimens were difficult to obtain. In the pass over the Patagonia Mountains, where the slopes are steep and brush-covered, considerable search failed to reveal the excavations of any gophers except those of the single individual taken.

THOMOMYS UMBRINUS INTERMEDIUS MEARNS

HUACHUCA MOUNTAIN POCKET GOPHER

Thomomys fulvus intermedius Mearns, U. S. Nat. Mus. Proc. 19: 719, July 30, 1897.

Type.—From summit of the Huachuca Mountains, southern Arizona (altitude 9,000 feet); collected by F. X. Holzner, September 6, 1893.

General characters.—A small, dark subspecies, closely allied to *burti* of the Santa Rita Mountains; color slightly darker; skull very similar, but nasals longer; dentition lighter.

Measurements.—Type: Total length, 200; tail, 66; hind foot, 26 millimeters.

Distribution and habitat.—The type, from 9,000 feet altitude near the summit of the Huachuca Mountains, is the only specimen examined and definitely assigned to this form. Specimens from Fort Huachuca, near the north base of the mountains, are referred to *proximus*.

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